The mango industry in Israel
Cultivation of different fruit crops in Israel under a Mediterranean climate

• Israel has a warm Mediterranean climate.
• However a wide range of climatic conditions allows growing diverse fruit species:
  • **Deciduous trees**: apple, pear, cherries, stone fruits, grape, pomegranate, fig and persimmon
  • **Subtropical**: citrus, avocado, mango, litchi, banana and date palm.
• We invest considerable efforts in the development of fruit production, suitable for cultivation under different conditions.
Mango in Israel - History

• Mango is a rather new crop to Israel.
• It was brought approximately 120 years ago from Egypt.
• Most “Modern” (Floridian) mango cultivars were introduced to Israel 90-100 years ago (1930-1940).
• Until the late 1960’s mango was not grown as a commercial crop.
• Applied horticultural research, at the Volcani center, the Faculty of Agriculture, together with extension services and the growers enabled to transform mango (as well as avocado) into a major crop.
Pioneers of mango introduction, breeding and research in Israel

Prof. Hannan Oppenheimer
Prof. Shmuel Gazit
Dr. Eli Tomer
Prof. Uri Lavi
Keys for success

Close cooperation and interaction of research, extension and growers, and rapid implementation of new technologies
Public Sector Agricultural Research and Development in Israel…

- Ministry of Agricultural and Rural Development units:
  - The Agricultural Research Organization (ARO)
  - The Agricultural Extension Service (SHAHAM)
  - The Plant Protection and Inspection Services (PPIS)
- Faculty of Agriculture at the Hebrew University
- Regional R&D stations
- Israeli mango Grower’s Board
Volcani Center Organizational Framework

- **Plant Science**
- **Plant Protection**
- **Postharvest & Food Science**
- **Soil, Water & Environmental Science**
- **Agricultural Engineering**
- **Animal Science**
Mango in Israel - climate

Frost

• Israel is one of the world’s most Northern countries having commercial mango production.
• Lower temperatures during winter, and events of frost limit mango orchards to restricted areas.
• Frost events usually occurs very locally and are not completely predictable.
• Even periods of several hours can cause severe damages.
Frost damages
Recovery of orchards following frost
Protection against frost using sprinklers
Mango in Israel - climate

Flowering and fruit settings

- Unpredictable weather conditions (both very warm and dry events and cold periods) during spring are not ideal conditions for mango flowering and fruit settings.
- Lower temperatures affect development of early inflorescences and inefficient fruit settings.
Efficient fruit setting by removal of early inflorescences

Control

Removal of early inflorescences
Mango in Israel - climate

Flowering and fruit settings

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- Lower temperatures affect development of early inflorescences and inefficient fruit settings.

- Events of very high temperatures results in increased fruitlet shedding and “sun burns”.
Mango in Israel - climate

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Kent
Tali
Mango in Israel - climate

Warm and dry summers

- The warm and dry summer conditions during fruit development and ripening enables high quality fruits that are clean of diseases.
  - No Anthracnose.
  - No bacterial black spot disease
- Conditions enable densely planted orchards to increase productivity.
Water and irrigation of mangoes in Israel

- Low quantity and quality of the water
- Salinity problems (water and soils)
- Dry season from April to October with practically no rain

- Efficient drip-irrigation
- Irrigation of approximately 8000 m³ water per year per hectare
Mango in Israel

**Soil conditions**

- Calcareous soil
- Basic pH, above 8.0
- Iron and zinc deficiencies

- Supplementation with iron-chelates (up to 50-kg /Ha/Year)
- Development of tolerant rootstocks
13/1 - a tolerant rootstock that enabled commercial mango production

- Screened from seedlings originated in Egypt, on the 1930’s by Prof. Oppenheimer.
- Became popular only on the 1970’s.
- Tolerant to basic soils (and somewhat to salinity).
- Polyembryonic.
- Currently, more than 95% of Israeli mango orchards are grafted on 13/1 rootstocks.
13/1 rootstock
Major mango diseases

Powderly mildew

Mango Malformation
Development of an efficient protocol to manage mango malformation

• Sanitation is the key for disease reduction
• Buds can be protected from windborne inocula during the “infection window” by a spray regime
Development of an efficient protocol to manage mango malformation

Sanitation is the key for disease reduction. Buds can be protected from windborne inocula during the "infection window" by a spray regime.
Development of an efficient protocol to manage mango malformation

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Mango orchards in Israel

- Traditionally grown in several regions in Israel.
- Transition to a main growing region in the Northern valleys.
- Success in malformation management leads to new interest in mango cultivation in previously affected regions of the country, enabling expansion of the ripening season.
Mango production in Israel

- Approximately 2,500 hectares.
- Annual yields 50,000 (60,000) tons.
- 40% of the fruits are exported, mainly to EU.
- Many new orchards are planted (more than 500 hectares in the last 5 years)
- Introduction and planting of new local cultivars.
‘Maya’

- Identified early on the 1930’s, out of a progeny of ‘Haden’ seedlings by Prof. Oppenheimer.
- Very tasty and juicy cultivar.
- Small fruit – 300 (200-500 gr).
- Mostly yellow with some red blush.
- Very short shelf life.

- Special protocols for marketing ‘Maya’ as a ready-to-eat cultivars were developed.
Maya
Maya
Traditional ripening calendar for Israeli cultivars
The Israeli Mango Breeding program and its new cultivars

Long term project led by Gazit, Tomer, Lavi and Cohen

Department of Fruit Tree Sciences
Volcani Research Center, ARO
Set of new Israeli mango cultivars
Shelly

Early cultivar – heart shape, attractive – 600 gr. Good quality.
Tali
Orli

Very early cultivar. Approximately 450 gr. Similar in shape to Shelly.
Attractive appearance, uniform size - 450 gr, Annanas taste, very good packing and transportability.
Attractive appearance, uniform size - 450 gr, Annanas taste, very good packing and transportability.
Agam

Early cultivar – high quality, attractive color, appealing appearance, very special teste.
Noa
Noa

a colorful alternative to Keitt?

Middle to late ripening, large (480-810 gr), colorful, elongated. Excellent interior quality.
Very tasteful cultivar, Bright colors, special shape.
Tango

Very tasteful cultivar, Bright colors, special shape.
KING DAVID - colorful late cultivar
KING DAVID - colorful late cultivar
Ripening calendar for Israeli cultivars

- Orli
- Agam
- Tali
- Omer
- Noa
- King David
- Tango
- Shelly
- Haden
- Maya
- Kent
- Tomy Atkins
- Keitt

June
July
August
September
October
## Current estimation of the Israeli mango industry

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Summary

- Israel is one of the world’s most Northern countries having commercial mango production.
- Cooperation of research, extension and growers enabled transformation of mango into a major crop.
- In the last 15 years, the industry has changed focusing on export markets, mainly into the EU.
- A set of high quality new Israeli cultivars replace many of the traditional orchards, enabling expansion of the industry.